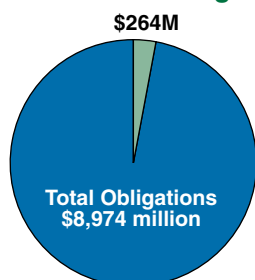


## Goal 8 FY 2000 Obligations



Note: EPA FY 2000 Obligations were \$8,974 million

## GOAL 8: SOUND SCIENCE, IMPROVED UNDERSTANDING OF ENVIRONMENTAL RISK, AND GREATER INNOVATION TO ADDRESS ENVIRONMENTAL PROBLEMS

EPA will develop and apply the best available science for addressing current and future environmental hazards, as well as new approaches toward improving environmental protection.

### OVERVIEW

Sound science allows EPA to identify the most important sources of risk to human health and the environment and therefore underpins the Agency's priorities and policies. It is critical that research and scientific assessment be integrated with EPA's policy and regulatory activities. As the Agency addresses increasingly complex issues in the future, its research programs will continue to provide the understanding and technologies needed to detect, abate, and avoid public health and environmental problems. Under Goal 8 EPA conducts core research to improve our understanding of the fundamental principles underlying risk assessment and risk management. Additionally EPA conducts problem-driven research to address specific environmental risks associated with a number of the other strategic goals, and descriptions of this research can be found in the discussion of these goals.

Goal 8 also highlights EPA's commitment to innovative, continuous improvement in how the Agency conducts its business and accomplishes its mission. This commitment, for instance, encourages the use of expert review and collaborative partnerships to ensure the highest level of quality in the Agency's work. Building on its scientific, economic, and regulatory research and analysis activities, EPA strives to make environmental protection more flexible, efficient, and effective, while minimizing the burden on the regulated community.

### FY 2000 PERFORMANCE

#### Understanding Ecosystems

EPA's ecosystems research program serves a key integrative function by enhancing the basic

understanding of the processes that govern ecosystem function as well as the technology needed to model those processes. In FY 2000 EPA continued to conduct research to develop the scientific understanding needed to measure, model, maintain, and restore the integrity and sustainability of ecosystems now and in the future. The Agency focused on developing verified decision support tools and methods and technologies to improve or maintain ecosystem conditions at the watershed scale. Efforts included a methods manual for the collection of biological, chemical, and physical habitat samples and a report on relationships between wetlands and land-use patterns and the quality of streams and biotic communities in watersheds of the Lake Superior Basin.

In 1989, concurrent with the beginning of the Environmental Monitoring and Assessment Program (EMAP), EPA began the Mid-Atlantic Integrated Assessment (MAIA) to provide integrated environmental assessment information as input into future environmental policy decisions. Ten years of representative regional monitoring provided by EMAP have produced several interim assessment products that decision-makers are already using. These reports include *An Ecological Assessment of the United States Mid-Atlantic Region: A Landscape Atlas* (1998) and *The Condition of the Mid-Atlantic Estuaries* (1999). A report on the state of Mid-Atlantic region highland streams was produced in FY 2000. The next phase of MAIA is the Regional Vulnerability Assessment (ReVA), part of EPA's FY 2000 initiative for the National Science and Technology Council's cross-Agency Integrated Science for Ecosystem Challenges (ISEC). ReVA will assess and compare current and future (up to 25 years hence) ecological vulnerabilities in the region to improve targeting of restoration and risk reduction activities. (<http://www.epa.gov/maia/html/reports.html>).

The Agency has also begun similar studies in the western United States and in coastal areas across the nation using EMAP monitoring and sampling procedures developed for use in the Mid-Atlantic region. For example, the Western EMAP Study will test the approach used by MAIA on a larger scale in a region that contains ecosystems, such as arid zones, not found in the Mid-Atlantic region. FY 2000 also marked the first year of the Coastal 2000 Initiative, a national demonstration of the EMAP monitoring design that will provide a comprehensive, statistically valid estimate of the health of the nation's estuaries.

### **Understanding and Detecting Risks to the Environment and Human Health**

Advances in the state of environmental science have illustrated that new risk assessment methods are needed to investigate complex environmental and human health issues across EPA's environmental protection programs. The unique susceptibilities of infants and children to exposure to toxic substances is an example of such issues.

The Agency is coordinating efforts to develop new methods, models, and measures to address three major areas of scientific uncertainty in human health risk assessment (1) measuring and modeling human exposure, (2) identifying or characterizing hazards and dose response, and (3) characterizing and assessing variation in human exposure and susceptibility to disease. In FY 2000 EPA developed risk assessment guidance and regional assessments for evaluating risks to children exposed to environmental contaminants. In addition the Agency continued its support of the eight pediatric research centers established in 1998 and issued a solicitation for proposals to establish a ninth center to focus on non-asthma-related research issues, such as developmental disorders.

In recent years EPA has begun moving toward a more proactive approach for protecting human and environmental health by anticipating potential risks before they become major concerns. FY 2000 research, for example, focused in part on endocrine disruptors. Specifically FY 2000 research products included protocols to screen pesticides and chemicals found in food and drinking water sources for their potential to cause estrogenic and other endocrine effects. EPA will use these methods to implement the screening and testing program requirements of the Food Quality Protection Act and the Safe Drinking Water Act

Amendments of 1996. Further research identified specific developmental and reproductive effects (and the mechanisms behind them) caused by certain endocrine-disrupting chemicals. Benefits of this work and similar efforts will include an improved framework for Agency decision-making, increased ability to anticipate and perhaps deter serious environmental risks, and enhanced communication with the public and other stakeholders.

In addition to the developments in risk assessment data, EPA's efforts over the past year produced further improvements in the economic information and methods available for use in the Agency's analyses. In FY 2000 the Agency continued to convene workshops for its ongoing economic research and policy series, bringing economists together to explore important topics, such as economic assessments of land use policies, community-based environmental decision-making, and methods applied by different government agencies to characterize benefits from enhanced food safety. EPA held additional workshops in collaboration with the Science Advisory Board to better integrate the methods and tools used to assess and manage human health risks, with a focus on characterizing cancer health effects. Also EPA and the National Science Foundation supported a series of new economic research solicitations directed at such priorities as market-based mechanisms and economic incentives, corporate environmental performance and the effectiveness of government intervention, and characterizing children's health benefits.

### **Understanding How to Prevent Pollution**

Research under Goal 8 has also focused on developing innovative pollution prevention strategies and technologies. In FY 2000 EPA undertook research to develop methods and decision tools that are more quantitative and easier for stakeholders and decision-makers to use when considering pollution prevention strategies, including computer-based tools for chemical and industrial processes. FY 2000 research also accelerated the adoption and incorporation of pollution prevention technologies by developing, testing, and demonstrating techniques applicable across economic sectors. In FY 2000 56 innovative technologies were verified through EPA's Environmental Technology Verification Program, which evaluates the performance of pollution prevention technologies that are ready for commercial application.

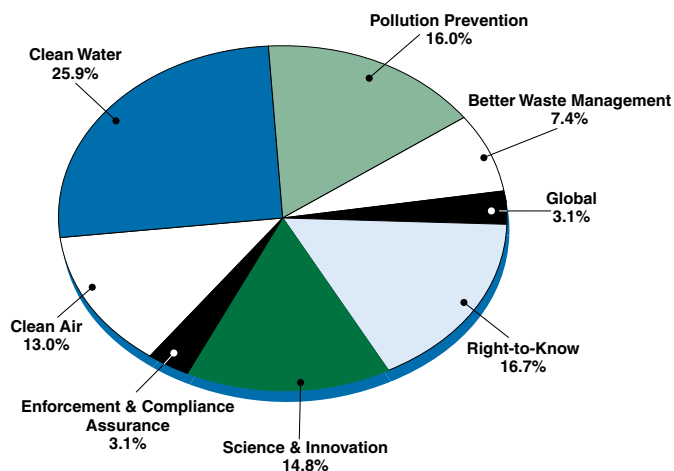
## Testing Sector- and Facility-Based Innovations

Another important program under Goal 8 is Project XL, which stands for “eXcellence and Leadership.” Project XL is a national initiative that tests innovative ways of achieving better and more cost-effective public health and environmental protection. EPA is using the information obtained and lessons learned from Project XL in redesigning its current regulatory and policy-setting approaches. EPA met its goal of 50 signed project agreements by the end of October 2000. To increase the opportunities for broader incorporation of innovative approaches into EPA programs, the Agency is increasing its efforts to identify and develop pilot projects targeted to specific programmatic needs. For example, Project XL is running a series of five projects designed to test alternative approaches for streamlining the water pretreatment program. There are also several projects to test the value of bio-reactor technology for solid waste landfills. The use of this technology could decrease emissions of landfill gas, accelerate waste decomposition, enhance groundwater protection, and increase the waste capacity of existing landfills. More information on Project XL is available on the Internet at <http://www.epa.gov/ProjectXL>.

Regarding sector-based innovations, EPA developed the *Sector Program Plan 2000-2005*, which has been endorsed by external stakeholders and will complete the integration of sector approaches into core federal and state environmental programs. EPA showed continuing progress in the Metal Finishing Strategic Goals Program, through which over 400 facilities in 21 states have, to date, voluntarily reduced sludge shipments to landfills by over 120 million pounds, wastewater discharges by 380 million gallons, and organic chemical releases by 700,000 pounds. EPA also developed new partnerships with four other industry sectors participating in the Sustainable Industries Program.

In FY 2000 EPA’s Regional Geographic Initiative (RGI) supported 137 projects, of which 58 were new projects fostering partnerships in additional parts of the country. All of the projects support Agency initiatives; contribute to at least one of the air, water, waste, toxics, and enforcement environmental goals; and support the overall national EPA mandates. For example, Region 4’s Chattanooga Air Toxics Study consolidated monitoring data to develop a risk assessment contributing to Goal 1 air toxics

## FY 2000 Distribution of Regional Geographic Initiative Projects Across Agency Goals



characterization work. In addition Region 8’s Missouri River Benthic Fish Study finished field work and moved into data analysis, contributing to Goal 2 clean water efforts.

Goal 8 efforts are also geared toward providing field sampling, analytical and data management support, and quality assurance to Agency programs nationwide. To ensure the highest quality scientific data is being generated by the Regional Science and Technology (RS&T) laboratories, the regions participated in a laboratory assessment program, which included internal reviews and external audits. In addition RS&T “Centers of Applied Science” (CAS) reflect state-of-the-art, nationally recognized expertise responding to Agency and stakeholder needs. In FY 2000 CAS developed methods and standard operating procedures for dioxins and furans, polychlorinated biphenyl (PCB) congeners, explosives, arsenic speciation, endocrine disruptors, and fish tissue extraction. EPA continues to partner with other federal, state, and local agencies to locate, assess, and share environmental data. These efforts build Agency capacity and assist partner agencies by providing technical and analytical support and by converting environmental data of sound and credible quality into useful decision-making information.

## Improving the Production and Use of Science at EPA Through the Science Advisory Board

EPA’s Science Advisory Board (SAB) provides independent peer review advice to the Administrator and Congress about the scientific underpinnings of Agency decisions to make a positive difference in the

production and use of science at EPA. In FY 2000 the SAB conducted reviews on key pollutants, including arsenic in drinking water and airborne particulate matter; risk assessment methodologies and methods, such as environmental technology verification; and policies, including the use of data from the testing of human subjects. The Board also held workshops to develop ways to merge the social sciences with the biological, chemical, and physical sciences to inform Agency decisions. FY 2000 saw the publication of *Toward Integrated Environmental Decision-making*. The recommendations of this SAB report (<http://www.epa.gov/sab/ecirp011.pdf>) hold the promise of a future of environmental protection that integrates science—and the scientific community—into the broader social enterprise of decision making in newer, more productive, more efficient ways.

## SUMMARY OF FY 2000 PERFORMANCE

In summary EPA made significant progress toward this strategic goal in FY 2000. The Agency continued to develop and apply the highest quality scientific methods and tools as it sought solutions to this nation's most pressing public health and environmental problems. EPA also looked to identify those areas that may pose hazards in the future. In addition the Agency continued to address environmental and human health issues through the use of new and innovative approaches that are not only scientifically sound, but also effective, efficient, and flexible.

## STRENGTHENING PROGRAM INTEGRITY THROUGH IMPROVED MANAGEMENT

In FY 2000 EPA continued its efforts to reinvent environmental regulation to achieve better results through the use of innovative and flexible approaches to environmental protection, encourage states, tribes, communities, and citizens to share in environmental decision making, make it easier for businesses to comply with environmental laws, and eliminate unnecessary paperwork. Lessons learned from Project XL pilots are being incorporated into permanent policy changes in EPA's programs and regional offices. The Agency also launched the Performance Track Program during FY 2000, which offers high performing companies a new, more flexible regulatory path. EPA will continue to involve stakeholders from national and local

environmental groups, industry, states, environmental justice organizations, and other interested parties in the design and implementation of these projects and activities.

Please see Section III - *Management Accomplishments and Challenges* for a further discussion of the above issues.

## PROGRAM EVALUATION

During the past year, EPA has actively participated with the National Academy of Public Administration in the Academy's evaluation of Agency and state reinvention efforts. The Agency reviewed 17 commissioned studies and the Academy's draft report. The final report published in November 2000 made sweeping recommendations to reinvigorate the whole environmental regulatory framework and specifically addressed new approaches for such issues as watersheds, emissions trading systems, adoption of environmental management systems, innovative approaches to permitting, and Superfund reform (<http://www.napawash.org/napa/index.html>).

## ASSESSMENT OF IMPACTS OF FY 2000 PERFORMANCE ON FY 2001 ANNUAL PERFORMANCE PLAN

Goal 8 Annual Performance Goals (APGs) in FY 2001 reflect generally successful performance in FY 2000.

Environmental research is long-term in nature, and its outcomes are often difficult to predict. Research outcomes do not necessarily occur on a regular basis, but rather at sometimes unexpected points over the lifetime of the work and beyond. A scientific model might yield benefits when it is used in the development of an environmental standard some time after work on the model has ended. Therefore APGs related to EPA's research programs represent those points in time when Agency scientists and engineers hope their work will produce noteworthy accomplishments.

In FY 2000 EPA launched a multiyear planning initiative that charts these critical junctures. This effort has the potential to dramatically streamline and improve the flow of performance results into future research planning. Under the initiative, Agency scientists have formed work groups to develop multiyear plans (MYPs)



for major research programs. These MYPs remain consistent with the Agency's Government Performance and Results Act structure and identify long-term goals for various research strategies. MYPs also present a set of measurable steps that enable achievement of the long-term goals. Although the MYPs cover a period of at least 5 years, they are living documents that are updated annually. Multiyear planning will allow EPA decision makers to better understand the impact of annual planning decisions on future research efforts and resulting performance achievements.

## **TABLES OF RESULTS**

The following tables of results includes performance results for the FY 2000 five Congressional APGs that appear in Goal 8. In cases where the FY 2000 APG is associated with an FY 1999 APG, the table includes the FY 1999 APG below the FY 2000 APG for ease in comparing performance. Additionally EPA is providing information on FY 1999 APGs for which data was not available when the FY 1999 report was published as well as those FY 1999 APGs that are not associated with any APGs in FY 2000.

**FY 2000 Annual Report**  
**Annual Performance Goals and Measures - Table of Results**

Summary FY 2000 Performance		GOAL 8 - SOUND SCIENCE, IMPROVED UNDERSTANDING OF ENVIRONMENTAL RISK, AND GREATER INNOVATION TO ADDRESS ENVIRONMENTAL PROBLEMS			
4	Goals Met	1	Goals Not Met	0	Other
FY 2000 ANNUAL PERFORMANCE GOALS AND MEASURES		FY 2000		FY 1999	
		Planned	Actual	Actual	
BY 2008, PROVIDE THE SCIENTIFIC UNDERSTANDING TO MEASURE, MODEL, MAINTAIN, OR RESTORE, AT MULTIPLE SCALES, THE INTEGRITY AND SUSTAINABILITY OF ECOSYSTEMS NOW AND IN THE FUTURE.					
2000 APG 59: Report on monitoring findings in the Mid-Atlantic Region as a cost effective means of measuring the condition of these systems.					Target year is FY 2001
(FY 1999) Complete and evaluate a multi-tiered ecological monitoring system for the Mid-Atlantic Region and provide select land cover and aquatic indicators for measuring status and trends (2001).					
Performance Measures					
- A final report on the extent and magnitude of fish tissue contamination in small, wadeable streams in the Mid-Atlantic Region as means of identifying high risk areas.		1	1		
- Final report on the relationship between macro-invertebrate and periphyton assemblages and chemical and physical stressors to verify the applicability of these biological indicators in the Mid-Atlantic Region.		1	1		
Explanation: Goal met. Reports were completed on monitoring findings regarding fish tissue contamination and biological indicators in the Mid-Atlantic Region. This research supports the long-term goal to design a more cost-effective scientifically sound environmental report card on these ecosystems in the future. The research also supports further development of ecological and biological criteria, improved designs for monitoring surface water quality, new indicators to assist in diagnosing degraded streams, rivers and estuaries, and development of better methods for evaluating improvements.					
Data Source: Agency generated material.					
Data Quality: As required by the Agency-wide formal peer review policy issued in 1993, and reaffirmed in 1994 and 1998, all major scientific and technical work products used in Agency decision-making are independently peer reviewed before their use. EPA has implemented a rigorous process of peer review for both its in-house and extramural research programs. Peer review panels include scientists and engineers from academia, industry and other federal agencies.					
BY 2008, IMPROVE THE SCIENTIFIC BASIS TO IDENTIFY, CHARACTERIZE, ASSESS, AND MANAGE ENVIRONMENTAL EXPOSURES THAT POSE THE GREATEST HEALTH RISKS TO THE AMERICAN PUBLIC BY DEVELOPING MODELS AND METHODOLOGIES TO INTEGRATE INFORMATION ABOUT EXPOSURES AND EFFECTS FROM MULTIPLE PATHWAYS.					
FY 2000 APG 60: Develop risk assessment guidance and regional assessments concerning risks to children exposed to environmental contaminants.					No FY 1999 APG
Performance Measures					
- Assess pesticide exposures to children in Washington, Minnesota, and Arizona.		1	1		
- Report on the use of mechanistic data in developmental toxicity risk.		1	1		
- Develop exposure factors handbook for children.		1	0		
Explanation: Goal not met. Two of the three critical performance measures supporting this annual performance goal were completed on schedule. The Exposure Factors Handbook was not completed due to the extension of the public comment period. The final handbook will be released in FY 2001. Reports on the use of mechanistic data in developmental toxicity risk assessment and assessments of pesticide exposures to children in Washington, Minnesota, and Arizona, were published in FY 2000.					

FY 2000 ANNUAL PERFORMANCE GOALS AND MEASURES		FY 2000		FY 1999
		Planned	Actual	Actual
<b>Data Source:</b>	Same as FY 2000 APG 59.			
<b>Data Quality:</b>	Same as FY 2000 APG 59.			
<b>BY 2008, ESTABLISH CAPABILITY AND MECHANISMS WITHIN EPA TO ANTICIPATE AND IDENTIFY ENVIRONMENTAL OR OTHER CHANGES THAT MAY PORTEND FUTURE RISK, INTEGRATE FUTURES PLANNING INTO ONGOING PROGRAMS, AND PROMOTE COORDINATED PREPARATION FOR AND RESPONSE TO CHANGE.</b>				
<b>FY 2000 APG 61: Develop tools to identify hazards and formulate strategies to manage risks from exposure to endocrine disrupting chemicals (EDCs) capable of inducing adverse effects in humans and wildlife.</b>  <i>(FY 1999) Initiate field exposure study of children to two endocrine disrupting chemicals.</i>  <b>Performance Measures</b> <ul style="list-style-type: none"> <li>- Workshop report on Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC) screening process for EDCs and application of the EDSTAC testing program for chemical hazard and risk assessment.</li> <li>- Characterization of environmental agents as risk factors in human prostate cancer.</li> <li>- Reports on endocrine and other effects in exposed women and their offspring in a contaminated cohort.</li> <li>- Reports on the molecular mechanisms underlying estrogen receptor functions in mice.</li> <li>- Development and refinement of test methods for use in Tier 1 testing of potential EDCs.</li> <li>- Development of amphibian assay for use in hazard identification.</li> </ul> <b>Explanation:</b> Goal met. Tools were developed to help identify hazards and formulate strategies to manage risks from exposure to EDCs. The finding of one report indicated that daughters of mothers exposed to poly-brominated biphenols (PBBs) begin menarche earlier than daughters of unexposed mothers. Methods were developed and refined for use in Tier 1 testing of potential EDCs. Reports were published on the molecular mechanisms underlying estrogen receptor (ER) functions in ER knockout mice and on the development of an amphibian assay used in hazard identification. A position paper that helped determine the application of the EDSTAC testing program for chemical hazard and risk assessment was published. Work characterizing environmental agents as risk factors in human prostate cancer was delayed, but this delay did not prevent substantive achievement of this goal.				Target year is FY 2008
<b>Data Source:</b>	Same as FY 2000 APG 59.			
<b>Data Quality:</b>	Same as FY 2000 APG 59.			
<b>BY 2006, DEVELOP AND VERIFY IMPROVED TOOLS, METHODOLOGIES, AND TECHNOLOGIES FOR MODELING, MEASURING, CHARACTERIZING, PREVENTING, CONTROLLING, AND CLEANING UP CONTAMINANTS ASSOCIATED WITH HIGH PRIORITY HUMAN HEALTH AND ENVIRONMENTAL PROBLEMS.</b>				
<b>FY 2000 APG 62: Complete development of one or more computer-based tools which simulate product, process, or system design changes, and complete proof-of-process structure for one or more generic technologies (applicable to more than one environmental problem) to prevent or reduce pollution in chemicals and industrial processes.</b>  <b>Performance Measures</b> <ul style="list-style-type: none"> <li>- Complete development of PARIS II Software tool to design environmentally benign solvents, and development and integration of Waste Reduction (WAR) Algorithm into commercially available chemical process simulator.</li> <li>- Complete Beta testing of a decision support tool for life-cycle analyses of municipal waste management options.</li> </ul>				No FY 1999 APG
		9/30/00	9/30/00	
		9/30/00	9/30/00	

FY 2000 ANNUAL PERFORMANCE GOALS AND MEASURES		FY 2000		FY 1999
		Planned	Actual	Actual
<b>Explanation:</b>	Goal met. EPA completed the development of two software programs: the PARIS II Software, a tool to design environmentally benign solvents; and the WAR Algorithm, version 1.0, a commercially available chemical process simulator. Furthermore, the beta testing of a decision support tool used in life-cycle analysis for municipal solid waste management options was completed.			
<b>Data Source:</b>	Same as FY 2000 APG 59.			
<b>Data Quality:</b>	Same as FY 2000 APG 59.			
<b>BY 2005, EPA WILL INCREASE THE NUMBER OF OPPORTUNITIES FOR AND APPLICATIONS OF SECTOR-BASED APPROACHES TO ENVIRONMENTAL MANAGEMENT BY 150% OVER 1996 LEVELS.</b>				
<b>FY 2000 APG 63:</b>	<b>All 50 Project XL projects will be in implementation.</b>	<b>50</b>	<b>50</b>	
(FY 1999)	50 Project eXcellence and Leadership (XL) Projects will be in development or implementation, an increase of 23 projects over 1998.			<b>24</b>
<b>Explanation:</b>	Goal met. There are 50 XL projects in place and entering the implementation phase.			
<b>Data Source:</b>	Manual system.			
<b>Data Quality:</b>	Data are manually verified.			

FY 1999 ANNUAL PERFORMANCE GOALS (ACTUAL PERFORMANCE DATA AVAILABLE IN FY 2000 AND BEYOND OR WITH PERFORMANCE TARGETS BEYOND FY 2000)			
		Planned	Actual
<b>FY 1999 APG:</b>	<b>Develop and verify innovative methods and models for assessing the susceptibilities of population to environmental agents, aimed at enhancing risk assessment and management strategies and guidelines.</b>	<b>Target year is FY 2008</b>	
<b>Explanation:</b>	In FY 2000 work continued to quantify the exposure of children to environmental agents such as organophosphates, trazines, and pyrethroids.		
<b>Data Source:</b>	Same as FY 2000 APG 59.		
<b>Data Quality:</b>	Same as FY 2000 APG 59.		

FY 1999 ANNUAL PERFORMANCE GOALS (NO LONGER REPORTED FOR FY 2000)	
<ul style="list-style-type: none"> <li>Analyze existing monitoring data for acid deposition and Ultraviolet-B (UVB) and implement a multiple site UVB monitoring system for measuring status and trends.</li> <li>Provide ecological risk assessment case studies for two watersheds, final guidelines for reporting ecological risk assessment, and ecological risk assessment guidance and support.</li> <li>Produce first generation exposure models describing residential exposure to pesticides.</li> <li>Improve Computational Efficiency of Fine Particulate Model by 25%.</li> </ul>	